[0053] **FIG. 22** illustrate the performance of a device using the rf focusing interface embodiment of the invention.

[0054] **FIG. 23** illustrates the microchannel plate aperture embodiment of the present invention.

[0055] **FIG. 24 a** three-dimensional plot of mass spectra of a two comonent mixture of bovine hemoglobin α and β analyzed using the present invention with a high resolution TOFMS.

[0056] **FIG. 25** gives tabulated data results for the experiment of **FIG. 24**.

DETAILED DESCRIPTION OF THE INVENTION

[0057] As used herein, "drift tube diameter" is defined as the distance from the spectrometer axis to the electrode surface nearest to the spectrometer axis. In the case of multiple coaxial series of electrodes, this distance refers to that from the spectrometer axis to the electrode surface nearest to the spectrometer axis of the innermost coaxial series of electrodes. It is synonymous with the expression "inner diameter".

[0058] As used herein, a "combination" of periodic field focussing and hyperbolic field focusing in an ion drift cell is any coexistence of the two types of fields in the drift cell; they may be sequential to one another (i.e., serial; and in any order) or be superimposed (i.e., a superposition) on one another. It may also include multiple field regions in the drift cell. It may also include one or more regions of a superposition and one or more other regions of a sequential combination.

[0059] As used herein, "electrode width" is defined as the ratio of the length, L, of the drift region to the total number, N, of periods in the drift region minus the inter-electrode gap width, G; alternatively, it is mathematically defined as (L/N)–G.

[0060] As used herein, "focusing", when used in reference to a beam of ions, is defined as any imaging event that reduces the spread of the ion beam to any degree; it does not necessarily require that the reduction result in a focus point.

[0061] As used herein, "gaps of a metal helix" are the distances between the wire or wire-like structures which make up the metal helix.

[0062] As used herein, a "heterogeneous electric field", or alternatively, an "electric field exhibiting substantial heterogeneity" is an electric field in which the deviation from a linear electric field along the spectrometer axis at each electrode or electrode gap is greater than 0.10%.

[0063] As used herein, a "homogeneous electric field", or alternatively, an "electric field exhibiting substantial homogeneity" is an electric field in which the maximum deviation from a linear electric field along the spectrometer axis at each electrode or electrode gap is no more than 0.10%.

[0064] As used herein, "hyperbolic focusing field" for an ion drift cell is defined as a field characterized by nonlinear equipotential lines and further characterized by an asymmetry of the nonlinear equipotential lines along the axis of the spectrometer.

[0065] As used herein, the abbreviation "IMS" is defined as ion mobility spectrometry.

[0066] As used herein, "inter-electrode gap" is defined as any distance between electrodes that does not consist of an electrode; this may, for example, be an insulating material or air.

[0067] As used herein, "inter-electrode gap width" is defined as the distance between adjacent coaxial electrodes within a series.

[0068] As used herein, MALDI is defined as matrix assisted laser desorption ionization.

[0069] As used herein, the abbreviation "MS" is defined as mass spectrometry.

[0070] As used herein, "period" is defined as an electrode at a unique potential. N is the "number of periods for a given drift tube length" and is the number of electrodes having unique potentials.

[0071] As used herein, the expression "periodic focusing field" for an ion drift cell is defined as an electric field characterized by alternating periods of substantial homogeneity and substantial heterogeneity in which the regions of substantial heterogeneity as measured by % ($\Delta V/V$) is greater than about 0.1.

[0072] As used herein, "potential" means an electrical potential or synonymously, a voltage.

[0073] As used herein, "resistively coated metal helixes" are continuous metal wires or wire-like structures coated with any resistive material, generally taking the shape of a coil.

[0074] As used herein, a "sequential" hyperbolic field and periodic field refers to a specific combination of the two fields characterized by distinct regions of either field without substantial overlap with the other field; the order (i.e., periodic followed by hyperbolic or vice versa) is unspecified without more. It is synonymous with a "sequential combination".

[0075] As used herein, the term "spectrometer axis" is defined as the major (lengthwise) axis of the spectrometer. This applies herein to both ion mobility instruments and mass spectrometric instruments.

[0076] As used herein, a "superposition" of a hyperbolic field and a periodic field refers to a specific combination of the two fields characterized by overlap of the two fields (i.e., the two fields are superimposed on one another) resulting in an overall resultant field.

[0077] As used herein, the abbreviation "TOFMS" is defined as time-of-flight mass spectrometry.

[0078] As used herein, a "unit helix thickness" is the width of the wire or wire-like structure of a resistively coated metal helix.

[0079] % ($\Delta V/V$) is defined as the percentage deviation from a linear electric field along the spectrometer axis at each electrode or electrode gap.

Hyperbolic Field Focusing

[0080] Hyperbolic focusing takes advantage of the fact that ions in gases follow very closely a path that is always